Honeywell

Installation Guide and Operating Manual

FSX™ Fire and Flame Detectors

Model FS24X™

FS24X QuadBand Triple IR™

Multi-Spectrum Infrared Electro-Optical Multi-Spectral Digital WideBand IR Sensor

Radiant Energy Fire and Flame Detector

Read and understand this manual before installing or operating equipment.

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TABLE OF CONTENTS

PAGE

SECTION 1: INTRODUCTION 4
1.1 Product Overview 4
1.2 Detector Technical Specifications 4
1.2.1 Mechanical Specifications 5
1.2.2 Electrical Specifications 5
1.2.3 Environmental Specifications 5
1.2.4 Performance Specifications 5
1.2.5 Hazardous Area Classifications 5
1.3 Features & Benefits 3
1.4 Applications 6

SECTION 2: INSTALLATION 7
2.1 Mounting Instructions 7
2.2 Opening the Detector 8
2.3 Detector Connections 9
2.4 Installation Practices 10
2.5 Start-Up and Commissioning 11

SECTION 3: OPERATION 13
3.1 Principle of Operation 13
3.2 Configuring the Detector 13
3.3 LED Status Indicators 15
3.4 Normal Operation 15
3.5 Alarm Condition 15
3.6 Fault Conditions 16
3.7 Maintenance 16

SECTION 4: APPENDIX 16
4.1 Warranty Information 17
4.2 Product Variations 17
4.3 Digital Communication Options 18
4.4 Test Lamps 19
4.5 Field of View Restrictor 16
4.6 Additional Performance Specifications 17
4.6.1 Flame Response Sensitivity 17
4.6.2 High Temperature Response 17
4.6.3 False Alarm Immunity 18
4.7 Drawings 19
4.7.1 Outline and Dimensions 19
4.7.2 Wiring and Terminal Connections 20
4.7.3 Detector Label Drawings 22

INDEX 23

SECTION 1: INTRODUCTION

1.1 Product Overview

The Model FS24X™ Detectors sense the WideBand IR™ radiant energy of blackbody particulate and molecular emissions generated by **BOTH** hydrocarbon and non-hydrocarbon flames and fires. The WideBand IR spectral radiant energy wavelengths sensed by the Quad (4) sensors span from approximately 0.4 to 5.5 microns for the **FS24X**.

The Model FS24X Multi-Spectrum Fire and Flame Detectors are designed and Factory Mutual approved for use in Class I, Div. 1 and 2, Class II and Class III Hazardous Locations and ATEX Certified Ex db IIC (T4-T6) and Ex tb IIIC (T4-T6) Flameproof (*Figure 1-1 & Figure 1-2*).

The FS24X Detectors are available in copper-free Aluminum or 316 Stainless Steel enclosure. The FS24X Detector electro-optical electronics module (puck) is enclosed in a field-replaceable black, hard anodized aluminum puck that provides superior ruggedness, handling, ease of installation, and protection against EMI/RFI.

Figure 1-1
FS24X Detector (110° Field of View)
Shown with 316 Stainless Steel Housing

FS24X Detector Field Connectors

The field connections feature two (2) connector choices for the installer:

1. A removable ten (10) pin screw terminal connector (J2) for hard-wired relay applications.
2. A removable six (6) pin screw terminal connector (J1) for analog output or RS-485 Digital Communication applications.

The removable connectors provide quicker installation and allows the Detector enclosure to be installed prior to the Detector Module (puck).

Figure 1-2
FS24X-9 Detector (90° Field of View)
Shown with Copper Free Aluminum Housing

UField Selectable Configuration Switches

1. The eight (8) pin DIP switch (SW2) is used to select the Detector's Sensitivity and Relay Options.
2. The ten (10) pin DIP switch (SW1) is used for:
   - Selecting a unique digital address (128 choices).
   - Factory Use
3. The ten (10) position Rotary switch allows selection of the analog and digital communication protocol.

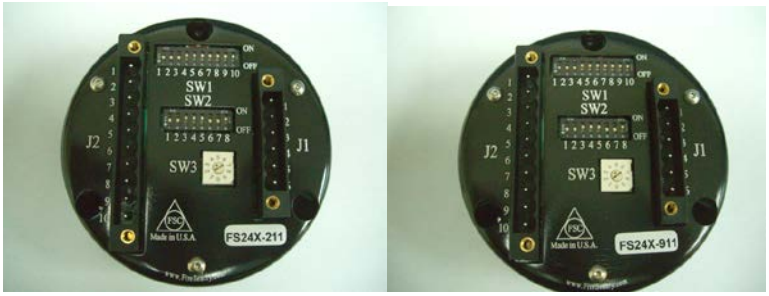


Figure 1-3
FS24X and FS24X-9 Detector Puck, (rear view)

1.2 Detector Technical Specifications

1.2.1 Mechanical Specifications

Enclosure Material:		Copper Free Aluminum 316 Stainless Steel
Physical Dimensions:	Assembly	4.35 in. (110.49 mm) Height X 4.81 in. (122.24 mm) Diameter
	Mounting Holes	¼ in. (6.35 mm) Diameter, 5.50 in. (139.70 mm) Center to Center
	Conduit Entries	Two (2) ¾ in. NPT or Two (2) 25 mm
Weight:	Aluminum	3 lbs. 11 oz. (1.7 kg) approximately
	Stainless Steel	7 lbs. 7 oz. (3.4 kg) approximately
Enclosure Rating:		IP66 / NEMA 4X
Vibration:		Meets or exceeds Mil Spec 810C, Method 514.2, Curve AW

1.2.2 Electrical Specifications

Input Voltage Range:	18 VDC to 32 VDC	
Normal Operation Current:	60 mA (nominal)	205 mA (nominal with heater[1])
Maximum Fire Alarm Current:	85 mA (maximum)	235 mA (maximum with heater[1])
Relay Contact Rating:	1 Amp @ 24 VDC resistive	
Analog Current Output: (400 Ohms Max Load)	0 to 20 mA (Source or Sink, User Selectable) 0.0 mA (<0.6 mA) = Fault 2.0 mA (±0.6 mA) = Dirty Window Lens 4.0 mA (±0.6 mA) = Normal, Safe (no Fault, no Fire) 20.0 mA (±0.6 mA) = Alarm or Verified Fire Alarm	
Screw Terminal Wire Sizes:	12 AWG to 22 AWG (2.50 mm to 0.762 mm) *Use stranded conductors (**not** solid core)*	

1.2.3 Environmental Specifications

Operating Temperature	Standard:	-40° F to +185° F (-40° C to +85° C)
	Extended-Temp[2]:	-76° F to +230° F (-60° C to +110° C) *Optional*
Operating Humidity Range:	0 to 95% RH, 100% RH condensing for short periods of time	
Storage Temperature:	-67° F to +221° F (-55° C to +105° C)	

1.2.4 Performance Specifications[2]

Field of View:	**FS24X**:	110° Horizontal and Vertical (conical)
	FS24X-9:	90° Horizontal and Vertical (conical)
Sensitivity:	One (1) sq. ft. heptane reference fire at 200 feet	
Speed of Response:	2 to 5 seconds (typical)	
High Speed Response:	Less than 0.5 seconds to “fireball” type fires (if selected)	
Spectral Sensitivity:	0.4 to 5.5 micron wavelengths, QuadBand Triple IR Plus	

1.2.5 Hazardous Area Calssifications (See Section 4.7.3 on Page 23)

Class I, Division 1, Groups A, B, C & D; Class II, Division 1 Groups E, F & G; Class III;
Class I, Zone 1, Ex db IIC (T4-T6) and Ex tb IIIC (T4-T6).

All FS24X-9 Detectors	**All FS24X-2 Detectors**
T4: Ta = -60°C to +110°C[3]	T4: Ta = -40°C to +110°C[3]
T5: Ta = -60°C to +75°C[3]	T5: Ta = -40°C to +75°C[3]
T6: Ta = -60°C to +60°C	T6: Ta = -40°C to +60°C

[1] Heater circuit turns ON only when temperature drops below zero (0) degrees Farenheit (-17° C)

[2] See Section 4.6 for Additional Performance Specifications

[3] The supply connection wiring shall be rated at least 10°C above the rated service temperature (120°C for T4 applications and 85°C for T5 applications)

1.3 Features and Benefits

- **Selectable Sensitivity (four settings)**
  User can set an FSX Detector to four (4) different Detector sensitivity levels *(see Section 3.2).*
- **Selectable Relay Options**
  User configurable for a variety of dry contact relay interface options (see Section 3.2).
- **Selectable 4 – 20 mA Output**
  User can set for Source or Sink non-isolated output (see Section 3.2).
- **Selectable Communications**
  User can configure for analog or digital communication outputs such as ModBus (see Section 3.2).
- **Selectable Digital Communication Address**
  Users can select unique 7-bit code (128 addresses) (see Section 3.2).
- **Lower Power Consumption**
  Requires smaller external power supplies and fewer system backup batteries.
- **Dual Microprocessors**
  Reduces the number of discrete Detector components, provides larger programming and memory capacity, and provides redundant self-checking.
- **100% Solid-State Quantum IR Sensors**
  Superior performance, stability, reliability, durability, and ruggedness. Provides higher MTBF and much wider operating temperature range.
- **Higher Operating Temperature**
  185°F (85°C) for more applications and 230°F (110°C) available for higher temperature applications.
- **Lower Operating Temperature**
  -40°F (-40°C) for more applications and -76°F (-60°C) available for lower temperature applications.
- **Built-In Automatic "Through-the-Lens" Self-Test**
  Monitors window lens obscuration and checks the operation of the Detector's Sensor Array and Electro-Optical Electronics Module.
- **Anodized Field Removable Detector Aluminum Module (Puck)**
  Rugged, superior protection against EMI/RFI and handling plus easier field installation and replacement.
- **Three Separate Bright LED's (Red, Yellow, Green)**
  Field status indicators with individual LED's for Alarm, Fault and Normal conditions. Provides superior Detector status viewing in bright outdoor environments (see Section 3.6).
- **FSC Windows® based PC Interface**
  User can perform remote FSX Detector diagnostics, real-time status, Real-Time Graphing (RTG™), SnapShot™ data recording, and downloading FirePic's™ with Honeywell Analytics' exclusive FSIM-2 USB Interface Unit and easy to use Windows® based PC Software.
- **Designed to Detect <u>both</u> Hydrocarbon and Non-Hydrocarbon Fires with one FSX™ Detector**
  All fire and flame threats are sensed, not just hydrocarbon fires as with other Triple IR Flame Detectors.
- **Designed, Manufactured, Tested, and Patented by Honeywell Analytics**
  Over 28 years of proven fire / flame detection product excellence worldwide.

1.4 Applications

Partial List of Applications:

Refineries	Gas Processing Plants	Offshore Drilling and Production Platforms
Cogeneration Plants	Gas Collection Facilities	Petroleum Product Pipelines & Pumping Stations
Petrochemical Plants	Gas Turbine Enclosures	Commercial and Military Aircraft Hangars
Crude & Product Tank Farms	LPG Storage/Distribution	Rail and Truck Loading/Unloading Terminals
Engine Test Cells	General Warehouses	Gasoline Loading Terminals
Power Plants	Aerosol Filling Facilities	Product Storage Terminals
Marine Terminals	Paint and Solvent Storage	Cold Storage Warehouses
Airport Terminals	Marine Engine Rooms	Gas Compressor Buildings

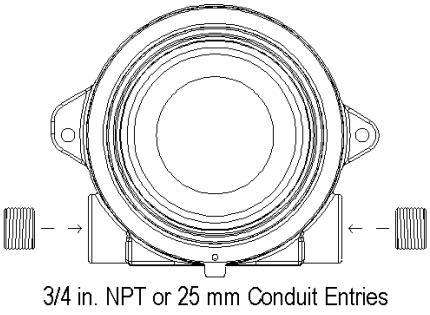
SECTION 2: INSTALLATION

2.1 Mounting Instructions

Consider the following guidelines when selecting Detector location:

1. As with all flame and fire Detectors, avoid areas that contain radiant energy sources (such as radiant heaters, high intensity lamps, flare-stacks, etc.) in close proximity to the Detector's field of view.
2. Detectors should not be mounted so that they look up or face the horizon (especially outdoors). Use a minimum thirty degrees (30°) downward angle with the SM4 swivel mount (see Figure 2-1).
3. Make sure the Detector has a clear, unobstructed view of the threat area. Physical obstructions between a fire and the Detector may cause the fire to be undetected.
4. The Model SM4 is a 316 Stainless Steel Swivel Mount designed for the Honeywell Analytics Detector housing. The adapter plate, with the two (2) screw holes (facing away), is attached to the base of the Detector (*see Figure 2-1*). The mounting plate, with the four (4) screw holes (facing towards), is used for mounting the SM4 to a solid surface. Each adjustment increment along an axis is calibrated to 10°. For single axis adjustments, the center section need not be installed.
5. Avoid mounting the Detectors in areas where temperatures exceeds the specified operating temperature range (*see Sections 1.2.3 & 1.2.5*).
6. Detector Conduit Entries
   - **a)** If only one conduit entry is used, correctly install and seal the conduit plug on the unused entry, ¾ in. NPT or 25mm (see Figure 2-2).
   - **b)** Install an approved conduit trap or drain, if required to meet hazardous area classifications per NFPA 70: National Electrical Code, latest revision.

Figure 2-1
SM4 Swivel Mount



Detector (front view)
Figure 2-2

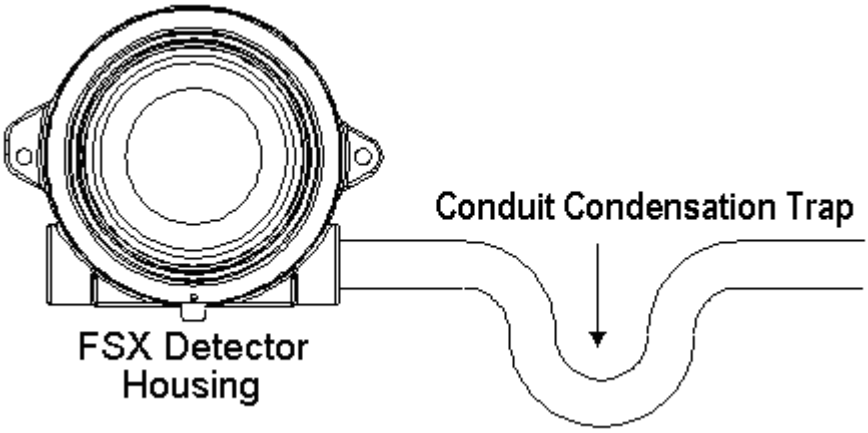


Figure 2-3

Mounting Instructions *(continued)*

Note the following Precautions:

1. ***Do not touch*** the sensors' windows on the front of the Detector electro-optical electronics module (puck). If touched accidentally, they should be cleaned following the instructions listed below (*see Figure 2-4*).
2. When cleaning the Detector's sensor windows on the puck, it is best to use Alcohol or IPA sparingly and a cotton swab.
3. There are no serviceable parts inside the Detector puck. If the puck is opened up or tampered with, all warranties are voided.

FSX Detector Module "puck"
Figure 2-4

CAUTION: Follow static protection procedures while handling the connectors and the wiring of the Module puck to the Detector. Use a wrist strap connected to earth ground.

2.2 Opening the Detector

It is necessary to remove the Detector Module puck from the enclosure to access the field connections.

CAUTION: Disconnect power before unscrewing the Housing Lid.

1. Loosen the set screw on the enclosure lid (*see Figure 2-5*).

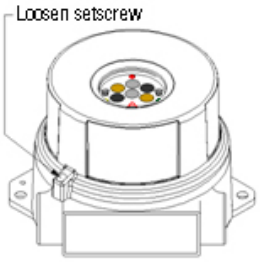


Figure 2-5

2. Turn counterclockwise (CCW) to unscrew the enclosure lid (*see Figure 2-6*).

Figure 2-6

Opening the Detector *(continued)*

3. Loosen the three captive screws on the Detector Module puck (*see Figure 2-7*).

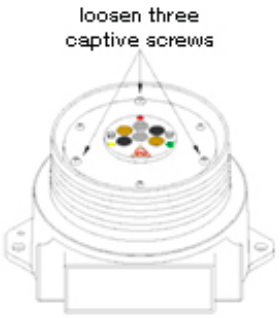


Figure 2-7

4. Slide the Detector Module puck out of the enclosure base (*see Figure 2-8*).

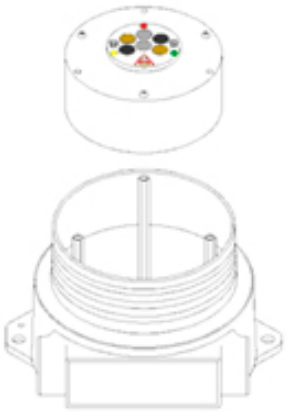


Figure 2-8

2.3 Detector Connections

The Detector Module puck has a six (6) pin and a ten (10) pin keyed removable connector with screw terminal female plugs that connect to the two (2) respective male connectors with analog, digital, and relay interfaces (*see Figure 2-9*):

- For **relay configurations**, use the ten (10) pin plug (J2) and its connector.
- For **digital and analog configurations**, use the six (6) pin plug (J1) and its connector.

J2 Connector

Pin	Connection
1	Auxiliary NC
2	Auxiliary NO
3	Auxiliary COM
4	Alarm NC
5	Alarm NO
6	Alarm COM
7	Fault NO
8	Fault COM
9	+24 VDC
10	DC Return

Contacts shown with no power applied

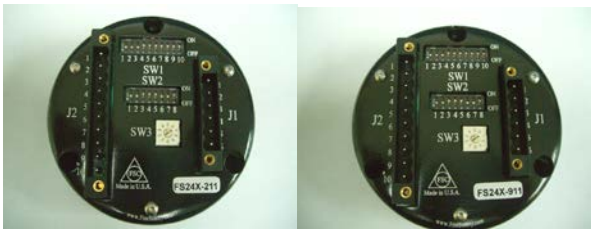


Figure 2-9
FS24X and FS24X-9 Detector Puck, (rear view)

J1 Connector

Pin	Connection
1	DC Return
2	RS-485-A
3	RS-485-B
4	+24 VDC
5	4-20mA Source
6	4-20mA Sink

Note: Do not attempt to open the Detector Module puck as this voids all warranties.

Detector Connections *(continued)*

ATTENTION: **FSX Power-Up** – After the application of 24 VDC input power or resetting the Detector, wait a mimimum of (thirty) 30 seconds to allow the Detector's sensors to normalize to the environment's spectral background conditions.

FSX Testing - As with any intelligent flame or fire Detector, please wait a minimum of thirty (30) seconds between tests (i.e., butane lighter, FSC test lamp, or test fires) to allow the Detector's sensors to fully normalize to the spectral background conditions.

Changing the Detector Settings – To activate changes to the settings using SW1, SW2 and SW3, reset the Detector by cycling (OFF, then ON) 24 VDC input power.

1. Make sure that the external 24 VDC input power is turned **OFF** before connecting the Detector.
2. Avoid wire splices. However, if wire splices are required, all splices should be soldered and properly insulated. The use of good wiring practices simplifies installation, improves reliability and facilitates maintenance.
3. For applications requiring analog/digital communications, please refer to Section 3.2 of this Instruction Manual.

2.4 Installation Practices

For installations in a Hazardous Classified Area, consult the National Electric Code Handbook, Articles 500 through 517 for the proper installation practices. For locations outside of the United States, observe local and/or regional regulations.

Model FS24X911-24-5 detectors must be connected to control panels meeting the requirements of either NFPA 71 or the local authority having jurisdiction.

IMPORTANT: The Detector's metal conduit plug by itself cannot make a weather tight seal. Metal-to-metal does NOT provide protection against the ingress of moisture. It is necessary to obtain an approved material to apply to the threads in order to maintain the "weather-proof" integrity and satisfy local/regional regulations.

Before completing the installation, check that the Detector is configured correctly for the specific application. The FSX Detectors Factory Default Settings are:

Alarm Relay Outputs are Non-Latching and Normally De-Energized	SW2-1 **OFF**	SW2-7 **OFF**
Detector Range / Sensitivity is Medium (2)	SW2-2 **OFF**	SW2-3 **ON**
Auxiliary Relay Verify Time is set to 5 seconds	SW2-4 **ON**	SW2-5 **ON**
End of Line Resistor is Disabled	SW2-6 **OFF**	
Fault Relay Output is Normally Energized	SW2-8 **ON**	
Communication is set to FireBusII™	SW3 is set to Position **4**	
Factory Use Only	SW1-1 through SW1-3 **OFF**	
Digital Communication Address is set to 127	SW1-4 through SW1-10 **ON**	

If the application for the Detector requires different settings, refer to Section 3.2 for detailed descriptions.

Before applying 24 VDC power to the Detector, make sure:

1. Wire connections are correct (Section 2.3). Each wire must be stripped properly to the correct length, loose wire strands must be removed and each wire must be securely and firmly screwed clockwise in the connector.
2. If using conduit, ensure a proper conduit seal, (appropriate for the area classification), has been installed and ***all measures to prevent moisture ingress have been taken.***
3. The FSX Detector is securely mounted and has an unobstructed view of the area of coverage (Section 2.1).
4. The Detector window is unobstructed and clean.

The Detector is now ready for Power-Up. ***on Power-Up, the Fault Relay will change status if the Factory Default Setting is used (Section 3.2).***

2.5 Start-Up and Commissioning

During Start-Up and Commissioning, **DISABLE** all outputs from the Detector to any control panels or control devices. As with any flame and fire detector, after the Detector(s) is powered, perform an external Detector test "end to end". Using an external hand-held test lamp ensures that the Detector has a clear unobstructed view of the threat area and the wiring is correct to the control panel or device.

Note: Honeywell Analytics FSX Detectors feature an automatic built-in "through the lens" test that verifies the cleanliness of its viewing window lens and test its internal electronics and software. As with any optical fire and flame detector, this does not constitute a fully functional "end to end" test as these types of internal self-tests only partially check and test the operational readiness of a detector.

In order to test the full functionality and operational readiness of any fire or flame detector "end to end", without starting a real fire (which is not permitted in hazardous areas), it is necessary to test the detector(s) with an external test lamp.

Using a test lamp is the only non-hazardous and safe method to test any flame or fire detector's sensors, internal electronics and its alarm activation software, viewing window lens cleanliness, terminal wiring integrity, actual relay activation, and the proper functionality of any other outputs that are used. Also, since most detectors are installed in a fire alarm system, this is the only method to test the complete fire alarm system, ensuring all the system wiring and cabling and system control panel are properly installed.

Additionally, using an external test lamp eliminates the following detector conditions:

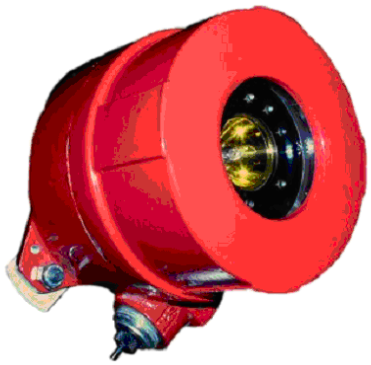
1. **The fire or flame detector(s)' window lens being covered up (such as paint, paint over spray, paint masking material, hanging garments, etc.),**
2. **Improperly positioned and oriented for coverage of the threat area,**
3. **Partial or full blockage of the detector's line of sight by one or more objects (i.e., recently installed air ducts or pipes, storage boxes, vehicles, etc.) such that the threat area is not fully protected. Since all optical fire and flame detectors are line-of-sight sensors, they must be properly positioned and oriented with an unobstructed view of the threat area so that they can detect flames/fires.**

To test the full functionality of a FSX Detector, use the Model TL1055X or TL2055X Test Lamp in the manner prescribed in this Instruction Manual.

WARNING: Use test lamp model TL1055s in *non-hazardous* locations only! For hazardous locations, use models TL2055 or TL2145, as described below.

The TL1055X and the TL2055X are the only Test Lamps that will activate the FSX Detectors.. Additionally, do not use these Test Lamps to activate other Honeywell Analytics Detectors (nor any other conventional fire and flame detectors). Do not use other Honeywell Analytics Test Lamps or non-Honeywell Analytics Test Lamps to test the FSX Detectors.

TL1055X Hand Held Test Lamp (NEMA 1)
Figure 2-12



TL2055X Hand Held Test Lamp for Hazardous Areas
Figure 2-13

Start-Up and Commissioning *(continued)*

Remember to disable the outputs, as a full functional test includes activating the ALARM outputs. A Honeywell Analytics Test Lamp must be used for this test (Section 4.4). Point the Test Lamp directly at the front of the Detector (on axis as much as possible, within a distance of about 1 to 25 feet). Activate the Test Lamp by pressing and holding its pushbutton. While watching the **red** ALARM LED on the face of the Detector, slowly move the Test Lamp's boresight to ensure the Detector receives its full intensity. **(NOTE: Practicing this technique may help to optimize testing of the FSX Detectors).** (Sections 3.6 and 4.4). The Detector's **red** ALARM LED will illuminate, usually within three (3) to ten (10) seconds. Also, the ALARM Relay outputs will activate and the 4-20 mA analog output will change to 20 mA (±0.6 mA).

If the Detector fails to respond within ten (10) seconds, do the following:

1. Wait ten (10) to twenty (20) seconds before performing another test.
2. **Check the Distance**: verify that the testing distance is between one (1) and twenty-five (25) feet from the FSX Detector(s).
3. **Check Aiming Accuracy**: verify that the proper testing technique (as described above) is followed.

SECTION 3: OPERATION

Figure 3.1 Principle of Operation

Honeywell Analytics' multi-spectrum and multi-spectral infrared Fire and Flame Detectors are sophisticated, state of the art, electro-optical digital radiant energy transducers that sense the wideband radiant energy emitted by fire's combustion processes that include flames' molecular emissions and hot particulate blackbody emissions. Radiant Energy Fire Detectors respond much faster to flames and fires at a longer distance than other types of conventional photoelectric and ionization smoke and heat detectors because a fire's emitted radiant energy travels at the speed of light. Fast response is critical for detecting flaming fires in time to successfully activate suppression or activate other fire responses such as closing fire doors. Seconds can make the difference between suppressing a small fire with little or no damage or having a disastrous fire that overwhelms a suppression system thereby failing to stop the fire.

Infrared (IR) consists of spectral wavelengths longer than the color red. The IR range for fire detection, which is invisible to the human eye, is from about 700 nanometers to 7000 nanometers (0.7 to 7.0 microns). Honeywell Analytics' FS24X Fire Detectors utilize a NearBand IR™ portion of the spectrum from approximately 0.7 to 1.1 microns and a WideBand IR portion from approximately 1.1 to 5.5 microns. This allows the FS24X Detectors to sense over 80% of the total radiant "Blackbody Energy" emitted by a fire. Honeywell Analytics' Detectors sense and measure the radiant energy generated by a fire at the speed of light.

FSX Detectors also utilize an additional spectral region, the Visible Band, that spans from about 400 to 700 nanometers (0.4 to 0.7 microns.) The Visible Band is used to further discriminate against non-fire false alarm sources. The Model FS24X Detectors also sense the specific WideBand 4.3 IR™ "Triple IR". Sensing these hydrocarbon wavelengths does not inhibit the Detector's ability to see non-hydrocarbon fires. Built-in microprocessors use sophisticated Digital Signal Processing (DSP) to accurately distinguish radiant energy from a real fire and a false alarm source(s). Honeywell Analytics has developed and refined these complex proprietary and patented WideBand IR algorithms over the last 30 years. These patented algorithms perform real-time DSP, and precisely analyze the signals in high-resolution frequency and time domains. This decision making process involves thousands of real-time calculations every second. Honeywell Analytics FS24X Detectors use solid-state high speed quantum sensors (not heat sensors such as pyroelectric or thermopile) that all respond to the fire's radiant energy emissions. The quantum sensors convert the rate of photonic energy directly into analog electrical signals. These analog signals are then converted to high resolution digital bits for real-time microprocessor analysis. The Detector microprocessors incorporate random access memory (RAM), read-only memory (ROM), and non-volatile flash memory. When the microprocessors determine that a real fire has been detected, the pre-alarm digital sensor data (FirePic™) and the event information are recorded in flash memory. Depending on the configuration, other actions may include activating one or more status LEDs, relays, a current loop and sending digital data such as the RS-485 FireBusII, and ModBus. If the microprocessors determine, based on internal testing and "through-the-lens" testing, that the Detector is not operating correctly, it records the Fault data and activates the Fault outputs and the yellow status LED. The digital data in the Detector can be easily accessed with a PC for later analysis and record keeping using Honeywell Analytics' Windows® based PC software and FSIM-2 USB Interface Unit.

Figure 3.2 Configuring the Detector

IMPORTANT: Changing the Detector Settings – To activate changes to the settings using SW1, SW2 and SW3, reset the Detector by removing and re-applying 24 VDC input power.

The Digital Address for the RS485 Communication can be set using positions 4 through 10 on SW1. Switch positions 1, 2 & 3 for SW1 are for factory use only and should not be changed.

Figure 3-1 (SW1)
Ten (10) Position DIP Switch

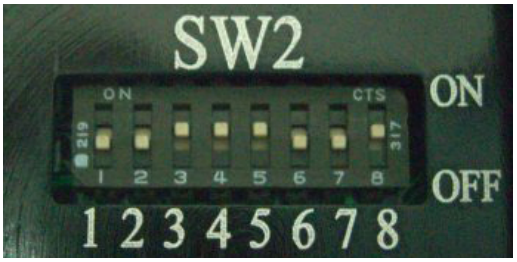
	1	2	3	4	5	6	7	8	9	10
127	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON
126	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	OFF
125	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF	ON
124	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF
003	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
002	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
001	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
000	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Configuring the Detector *(continued)*

CAUTION – WARNING

When the switches SW1, SW2, or SW3 are changed, the Detector's input power must be cycled OFF, then ON, in order for the change(s) to be accepted.

Eight (8) position DIP Switch (**SW2**) – Figure 3-2



Use the following tables to configure the Detector:

Alarm Relay	SW2-1
Latching	ON
Non-Latching	OFF

Sensitivity Levels		SW2-2	SW2-3
Very High	(4)	ON	ON
High	(3)	ON	OFF
Medium	(2)	OFF	ON
Low	(1)	OFF	OFF

Auxiliary Relay	SW2-4	SW2-5
No Verify Time	ON	ON
5 Sec Verify Time	ON	OFF
10 Sec Verify Time	OFF	ON
20 Sec Verify Time	OFF	OFF

During a fire, model FS24X-911-24-5 detectors will alarm in non-latching mode and will unlatch when the fire decreases. If the condition persists and begins to grow, the detectors will re-alarm.

EOL Resistor	SW2-6
Enabled	ON
Disabled	OFF

Alarm Relay	SW2-7
Energized	ON
De-Energized	OFF

Factory default settings are shown with a gray background.

Fault Relay	SW2-8
Energized	ON
De-Energized*	OFF

*If the Fault Relay to set to "De-Energizied", the Detector will not report any faults due to loss of input power to the Detector.

Analog and digital outputs are available in addition to relay outputs. Select from two (2) analog outputs or two (2) digital outputs using a ten (10) position Rotary Switch (SW3). FireBusII is the factory default setting. Use Table on the right and Figure 3-3 to configure SW3.

Figure 3-3 SW3
Ten (10) Position Rotary Switch

Position	Output Selection
0	4-20 mA Sink
1	4-20 mA Source
2	RS-485 ModBus
3	Factory Use Only
4	RS-485 FireBusII
5	Factory Use Only
6	Factory Use Only
7	Factory Use Only
8	Factory Use Only
9	Factory Use Only

3.3 LED Status Indicators

The Model FS24X Detector uses three (3) separate, bright LED's to indicate the Detector's status.

- The **Green** LED blinks (flashes) once every ten (10) seconds to indicate a Normal, safe operational condition (i.e. no Faults and no Alarms). The Green LED is OFF when no external 24 VDC input power is applied to the Detector.
- The **Red** LED turns ON when a fire is Alarmed.
- The **Yellow** LED blinks (flashes) when the window lens is dirty. For all other Fault conditions, the Yellow LED will turn ON.

3.4 Normal Operation

In **Normal** operation, the bright **Green LED** blinks (flashes) every 10 seconds. See Figure 3-4 for the location of the **Green LED**. Normal Operation is defined as the Detector with 24 VDC applied and no **Alarm** or **Fault** conditions are present. If one of the 4-20 mA options are selected (Table 3-1), the current, sink or source, will be 4.0 mA (±0.06 mA).

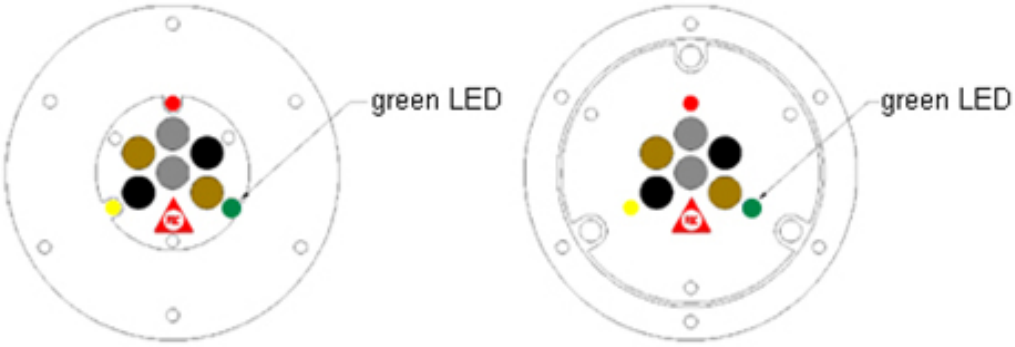


Figure 3-4
Green LED Location

3.5 Alarm Condition

When an **Alarm** condition occurs, the **Red LED** will turn **ON**, (factory setting with the **Auxiliary** relay set to "0" seconds). See Figure 3-5 for the location of the **Red LED**.

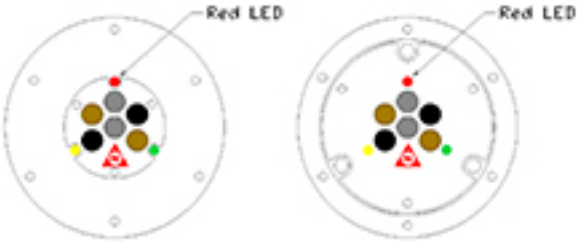


Figure 3-5
Red LED Location

The Detector has the following outputs with an **Alarm** condition:

- Alarm Relay activation
- Auxiliary Relay activation[1]
- 4-20 mA (sink 20 mA) Output[2]
- 4-20 mA (source 20 mA) Output[2]
- RS-485 FireBusII Alarm Notification[2]
- RS-485 ModBus Alarm Notification[2]

1 This output is a Verified Alarm Output

2 Only one active **Alarm** output from this group

3.6 Fault Conditions

When a **Fault** (Trouble) condition occurs, the **Yellow LED** will illuminate. See Figure 3-6 for the location of the **Yellow LED**.

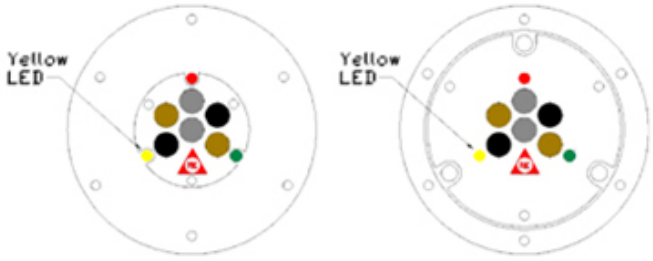


Figure 3-6
Detector Module, Front View

The Detector has the following outputs with a **Fault** condition:

- Fault Relay activation
- 4-20 mA (sink) Output[3]
  2 mA (Dirty Window Fault)
  0 mA (All Other Faults)
- 4-20 mA (source) Output[3]
  2 mA (Dirty Window Fault)
  0 mA (All Other Faults)
- RS-485 FireBusII Fault Notification[3]
- RS-485 ModBus Fault Notification[3]

3 Only One Active **Fault** output from this group

Fault (Trouble) conditions can be caused by:

- Under Voltage Input Power (< 18 VDC).
- Over Voltage Input Power (> 32 VDC).
- Over Temperature (> 85° C or 185° F for the Standard Version).
- Over Temperature (> 110° C or 230° F for the Extended Temperature Version).
- Under Temperature (< -40° C or -40° F for the Standard Version).
- Under Temperature (< -50° C or -58° F for the Extended Temperature Version).
- One or more Microprocessor Failures.
- One or more Relay Coil Failures.
- Communication Fault.
- Electronic Self-Test Failure.
- Dirty Window Lens (**Yellow** LED flashes, the **Yellow** LED is ON [solid] for all other Faults).

3.7 Maintenance

After the FS24X Detector is installed and commissioned, there is little maintenance required. However, a complete “end-to-end” test of the entire fire detection system should be performed periodically depending on the application. Additionally, semi-annual or quarterly testing should be performed, using the correct Honeywell Analytics Test Lamp, to ensure the integrity of the entire fire protection system.

In order to ensure the Detector is operating properly at all times, it may be necessary to establish a periodic cleaning schedule. Some industrial environments may necessitate more frequent cleaning of the Detector’s optical surfaces than others.

WARNING – Potential Electrostitic Charge, wipe enclosure only with a damp cloth

SECTION 4: APPENDIX

4.1 Warranty Information

Honeywell Analytics warrants its Products against defects in material and workmanship under normal use and service for a period of two (2) years from the date of shipment as described herein. Honeywell Analytics, at its option, will repair or replace, at no charge, such products found to be defective during the warranty period provided that they are returned in accordance with the terms of this warranty. Replaced parts or boards are warranted for the balance of the original applicable warranty period. All Replaced parts of Products shall become the property of Honeywell Analytics. This express limited warranty is extended by Honeywell Analytics to the original purchaser only and is not assignable or transferable to any other party. This is the complete warranty for the Products manufactured by Honeywell Analytics. Honeywell Analytics assumes no obligations or liability for additions or modifications to this warranty unless made in writing and signed by an officer of Honeywell Analytics. Honeywell Analytics does not warrant the installation, maintenance or service of its Products. Honeywell Analytics is not responsible in any way for ancillary equipment not furnished by Honeywell Analytics, which is attached to or used in connection with its Product(s), or for operation of the Product(s) with ancillary equipment and all such equipment if expressly excluded from this warranty. This warranty sets forth the full extent of Honeywell Analytics' responsibility regarding the Products' repair or replacement at Honeywell Analytics' options, is the exclusive remedy.

This Warranty is given in lieu of all other Express Warranties, Implied Warranties, including without limitation, Implied Warranties of Merchantability and fitness for a particular purpose, are limited to the duration of this Limited Warranty. In no other event shall Honeywell Analytics be liable for damages in excess of the purchased price of the product(s), for any loss of use, loss of time, inconvenience, commercial loss, lost profits or savings or other incidental, special or consequential damages arising out of or in connection with the use or inability to use such product, to the full extent such may be disclaimed by law.

THIS WARRANTY DOES NOT COVER:

1. Defects or damage resulting from use of the Product(s) in other than its normal and customary manner.
2. Defects or damage from misuse, accident, or neglect.
3. Defects or damage from improper testing, operation, maintenance, installation, alteration, modification or adjustment.
4. Product(s) subject to unauthorized Product modifications, disassemblies or repairs (including, without limitation, the audition of the product of non-Honeywell Analytics supplied equipment) which adversely affect performance of the Product(s) to interfere with Honeywell Analytics' normal warranty inspection and testing of the Product(s) to verify any warranty claim.
5. Product(s) that have had the serial number removed or made illegible.
6. Freight cost to the repair facility.
7. A Product which due to illegal or unauthorized alteration of the software/firmware in the Product, does not function in accordance with Honeywell Analytics' specifications.
8. Scratches or other cosmetic damage to Product surfaces that do not affect the operation of the Product.
9. Normal and customary wear and tear.

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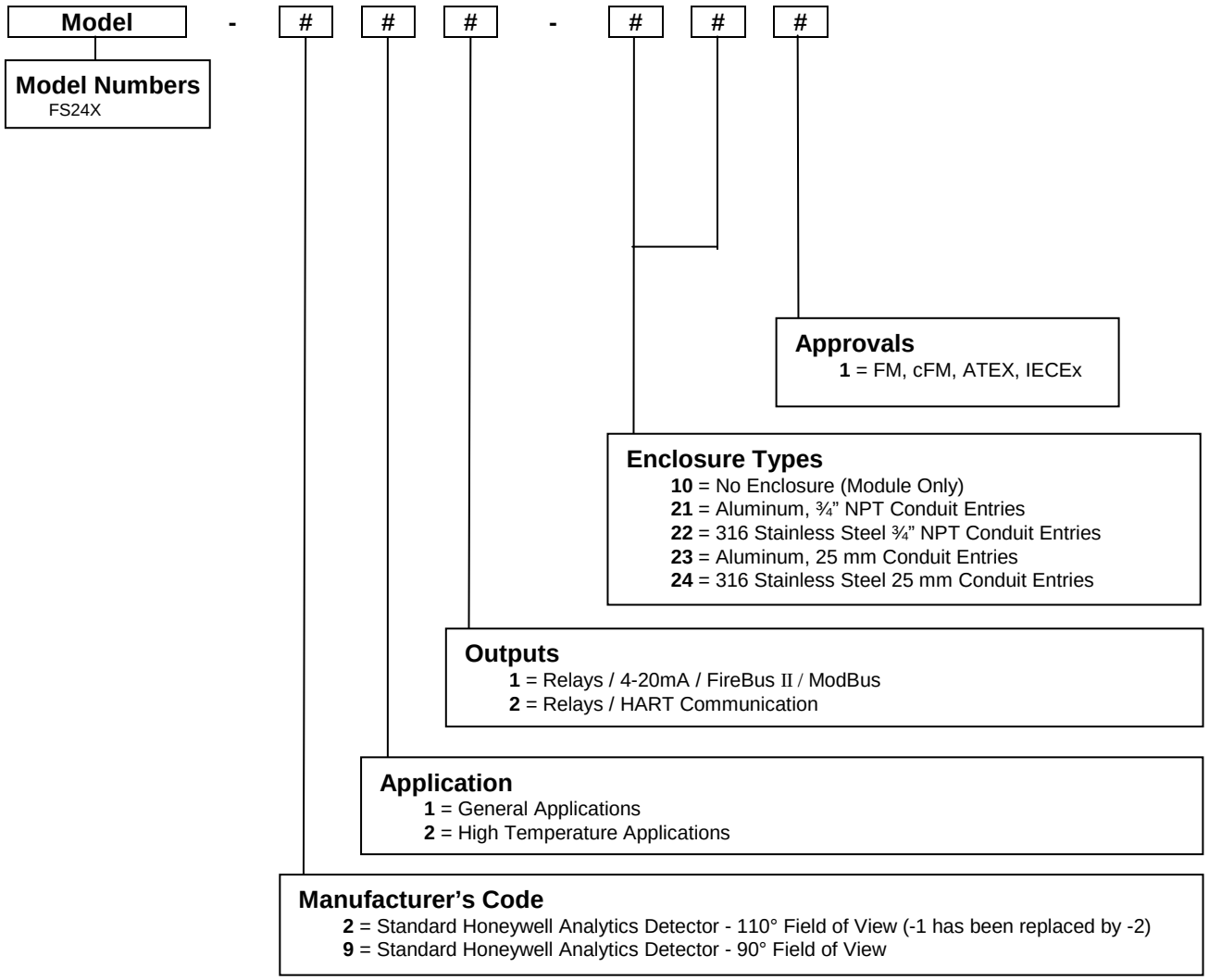
4.2 Product Variations

There are product variations above and beyond those that are field selectable by the end user(s). These variations are provided for the customer that has specialized needs.

Here is a list of current ordering options for the Model FS24X and FS24X-9:


Model - # # # - # # #
Model Numbers
FS24X
Approvals
1 = FM, cFM, ATEX, IECEx
Enclosure Types
10 = No Enclosure (Module Only)
21 = Aluminum, ¾" NPT Conduit Entries
22 = 316 Stainless Steel ¾" NPT Conduit Entries
23 = Aluminum, 25 mm Conduit Entries
24 = 316 Stainless Steel 25 mm Conduit Entries
Outputs
1 = Relays / 4-20mA / FireBus II / ModBus
2 = Relays / HART Communication
Application
1 = General Applications
2 = High Temperature Applications
Manufacturer's Code
2 = Standard Honeywell Analytics Detector - 110° Field of View (-1 has been replaced by -2)
9 = Standard Honeywell Analytics Detector - 90° Field of View

EXAMPLES:

FS24X-911-211
QuadBand Triple IR Detector, 90° Field of View, General Applications with Relays, 4-20mA Output, FireBusII, Aluminum Enclosure with ¾ inch NPT Conduit Entries, Approvals: FM, cFM, ATEX, IECEx: Class I, Division 1, Groups A, B, C & D; Class II, Division 1 Groups E, F & G; Class III; Class I, Zone 1, Ex db IIC (T4-T6) and Ex tb IIIC (T4-T6).

FS24X-211-221
QuadBand Triple IR Detector, 110° Filed of View, General Applications with Relays, 4-20mA Output, FireBusII, 316 Stainless Steel Enclosure with ¾ inch NPT Conduit Entries, FM, cFM, ATEX,IECEx: Class I, Division 1, Groups A, B, C & D; Class II, Division 1 Groups E, F & G; Class III; Class I, Zone 1, Ex db IIC (T4-T6) and Ex tb IIIC (T4-T6).

4.3 Digital Communication Options

The FS24X Detectors have a variety of RS-485 Digital Communication options that can be selected using its Rotary Switch SW3.

SW3 Position	Outputs
0	4-20mA Current Sinking
1	4-20mA Current Sourcing
2	ModBus RTU
3	Reserved for Factory Use
4	FireBus II
5 through 9	Reserved for Factory Use

4.4 Test Lamps

Some manufacturers claim that their detectors do not need remote testing with an external Test Lamp because it tests itself. Even though Honeywell Analytics Detectors also perform "through the lens" self-testing and tests themselves, Honeywell Analytics, in compliance with NFPA 72 codes, has developed portable test lamps for periodical "end-to-end" testing their Detectors remotely. Some of the most important functions of the remote test lamp are to ensure the Detector's optical path is not blocked, the Detector is aimed properly at the fire threat area (that the Detector mounting bracket didn't move or was accidentally bumped by someone), and the Detectors alarming circuitry and outputs (i.e. relays, 4-to-20 mA, etc.) function properly. Internal Detector testing and window lens cleanliness testing cannot insure the Detector is aimed properly, that its view of the fire scene has not been blocked by something such as a newly installed pipe or duct, storage box, parked vehicle, etc., and its alarm outputs are functioning properly.

For calibrated testing, in compliance with NFPA 72 Codes for flame detectors, as manufacturers of the FSX product line, our calibrated testing using our FT-2055X Test Lamp is as follows. If the FS24X set at Highest Sensitivity alarms to a fully charged FT-2055X Test Lamp at a distance between 1 and 25 feet, then the FS24X is in normal operating condition.

WARNING: Use test lamp model TL1055s in *non-hazardous* locations only! For hazardous locations, use models TL2055 or TL2145, as described below.

TL1055X is a general purpose NEMA 1 hand held rechargeable Test Lamp designed for testing the FS24X Detectors externally. The hand held Test Lamp (see Figure 4-1) comes with a Universal Charger (110 VAC and 220 VAC).

Figure 4-1
TL1055X Hand Held Test Lamp (NEMA 1)

TL2055X is a Class I, Div. 1 approved Explosion-Proof Test Lamp designed for testing the FS24X Detectors externally, in a hazardous location. The hand held Test Lamp (see Figure 4-2) comes with a Universal Charger (110 VAC and 220 VAC).

Figure 4-2
TL2055X Hand Held Test Lamp (Class I, Division 1)

4.5 Field of View Restrictor

There are some unique and specialized applications that may require a restricted field of view in order to prevent the Detector from alarming to a known (friendly) fire/flame source (such as a flare stack). The Model FVR-01 Field-of-View Restrictor is easily modified in the field with a simple hack saw to obtain custom Detector field-of-views for applications where specific narrow field-of-views are required. The Model FVR-01 Detector accessory has been developed specifically for these unique types of applications.

4.6 Additional Performance Specifications

4.6.1 Flame Response Sensitivity

The following table provides FS24X typical INDOOR response times and distance to various fuels:

FS24X QuadBand (Very High [4] Sensitivity)			
Fuel	**Fire Size**	**Distance**	**Typical Response**
N-Heptane	6 in X 6 in (0.15m X 0.15m)	90 feet (27 meters)	5 seconds
Acetylene	48 in X 3/8 in (1.2 meter) Plume	90 feet (27 meters)	< 5 seconds
Cardboard (single 1/8in wall)	7.5 x 7.5 x 7.5 in (191 x 191 x 191 mm)	90 feet (27 meters)	< 8 seconds
Diesel	6 in X 6 in (0.15m X 0.15m)	90 feet (27 meters)	5 seconds
Ethanol	12 in X 12 in (0.3m X 0.3m)	60 feet (18 meters)	< 5 seconds
IPA	6 in X 6 in (0.15m X 0.15m)	90 feet (27 meters)	< 8 seconds
JP-4	6 in X 6 in (0.15m X 0.15m)	90 feet (27 meters)	< 5 seconds
JP-8	6 in X 6 in (0.15m X 0.15m)	90 feet (27 meters)	< 5 seconds
Methane	48 in X 3/8 in (1.2 meter) Plume	90 feet (27 meters)	< 5 seconds
Methanol	12 in X 12 in (0.3m X 0.3m)	60 feet (18 meters)	< 5 seconds
Paper	24 Standard 8.5 x 11 sheets	90 feet (27 meters)	< 8 seconds
Silane	1 foot (0.3 meter) Plume	15 feet (4.5 meters)	< 5 seconds

The following table provides FS24X typical OUTDOOR response times and distance to various fuels:

FS24X QuadBand (Very High [4] Sensitivity)			
Fuel	**Fire Size**	**Distance**	**Typical Response**
N-Heptane	12 in X 12 in (0.3m X 0.3m)	200 feet (61 meters)	4.2 seconds
N-Heptane	12 in X 12 in (0.3m X 0.3m)	264 feet (80 meters)	< 15 seconds
Diesel	12 in X 12 in (0.3m X 0.3m)	150 feet (45.75 meters)	< 5 seconds
Ethanol	12 in X 12 in (0.3m X 0.3m)	75 feet (26 meters)	< 5 seconds
IPA	12 in X 12 in (0.3m X 0.3m)	175 feet (53 meters)	< 5 seconds
Methane	48 in X 3/8 in (1.2 meter) Plume	90 feet (27 meters)	< 8 seconds
Methanol	12 in X 12 in (0.3m X 0.3m)	60 feet (18 meters)	< 5 seconds
Paper (8½ x 11 sheets)	Shredded (loosely packed) 1 foot cube	50 feet (15 meters)	< 8 seconds
Pine Needles	12 in X 12 in (0.3m X 0.3m)	50 feet (15 meters)	< 8 seconds
Wood	12 in X 12 in (0.3m X 0.3m)	90 feet (27 meters) 50 feet (15 meters)	< 6 seconds

4.6.2 False Alarm Immunity

The following tables represent the minimum distance at which the Detector did not false alarm or show any signs of instability during exposure to the sources listed below. Additionally, the sensitivity to a one (1) square foot n-Heptane reference pan fire in the presence of the false fire source is listed.

False Fire Source	Minimum Distance with no Alarm	Sensitivity to a 1' x 1' n-Heptane reference pan fire in the presence of the false fire source
Direct Sunlight	No Alarm	50 feet /15.24 meters
Modulated Sunlight	No Alarm	25 feet / 7.62 meters
Modulated Arcwelding	3 feet 9 inches / 1.14 meters	Source at 15 feet / 4.57 meters Fire at 30 feet / 9.14 meters
Continuous Arcwelding	3 feet 9 inches / 1.14 meters	Source at 15 feet / 4.57 meters Fire at 30 feet / 9.14 meters
Resistive Electric Heater	1 foot / 30.48 centimeters	Source at 3 feet / 91.44 centimeters Fire at 200 feet / 60.96 meters
Flourescent Lamp	1 foot / 30.48 centimeters	Source at 3 feet / 91.44 centimeters Fire at 200 feet / 60.96 meters
Halogen Lamp	1 foot / 30.48 centimeters	Source at 7 feet / 2.13 meters Fire at 200 feet / 60.96 meters
Sodium Vapor Lamp	1 foot / 30.48 centimeters	Source at 3 feet / 91.44 centimeters Fire at 200 feet / 60.96 meters
Pelican Flashlight	1 foot / 30.48 centimeters	Source at 3 feet / 91.44 centimeters Fire at 200 feet / 60.96 meters
Incandescent Lamp	1 foot / 30.48 centimeters	Source at 3 feet / 91.44 centimeters Fire at 200 feet / 60.96 meters

4.7 Drawings

4.7.1 Outline and Dimensions

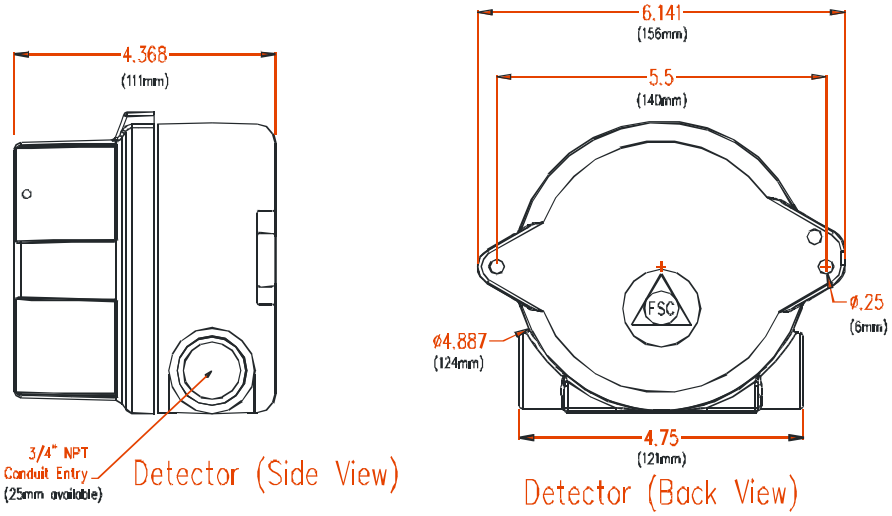


Figure 4-3
Outline & Dimesional Drawing for FS24X

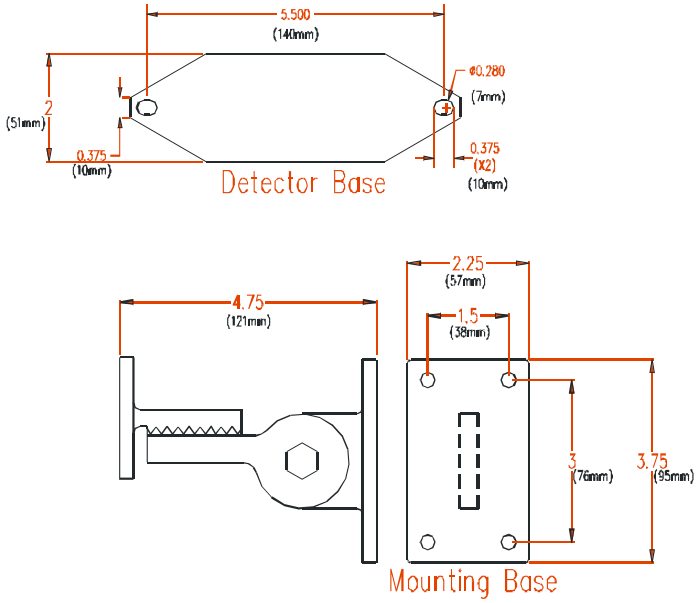


Figure 4-4
Outline & Dimesional Drawing for SM4

Drawings *(continued)*

4.7.2 Wiring and Terminal Connections

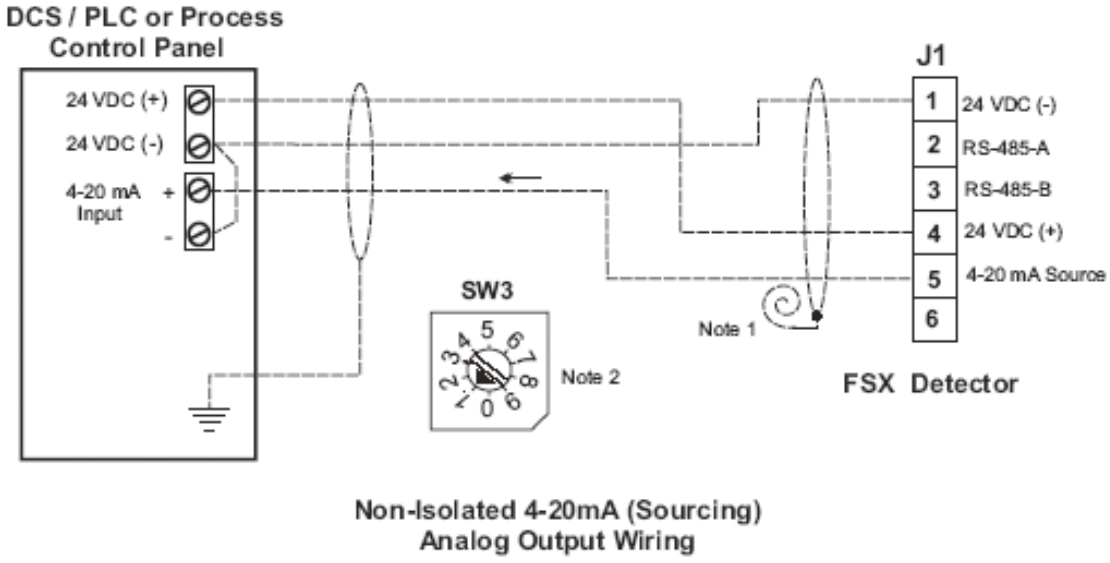


Figure 4-5
Typical Wiring for 4-20mA (Sourcing) Analog Output

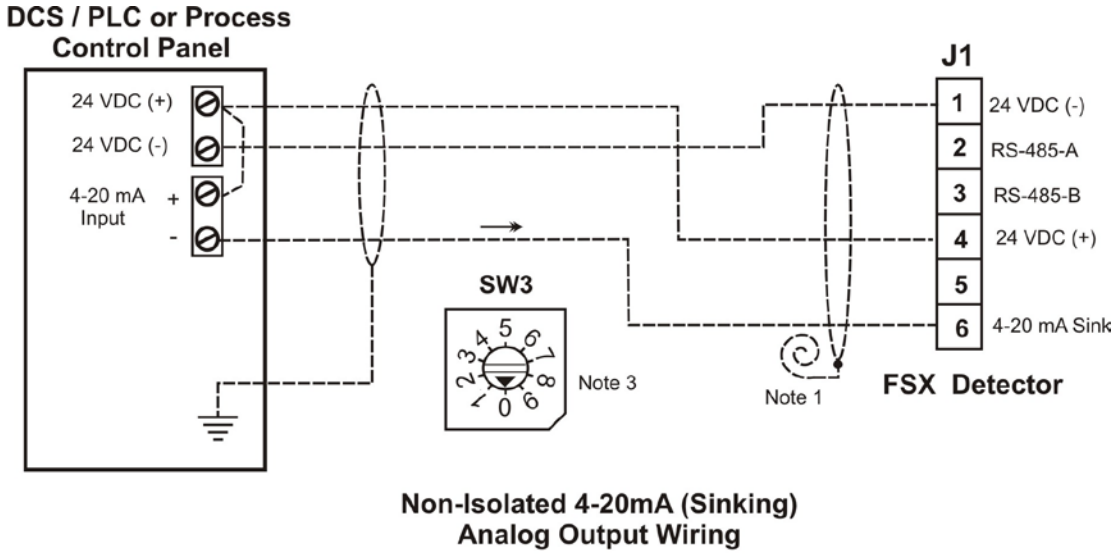


Figure 4-6
Typical Wiring for 4-20mA (Sinking) Analog Output

NOTES:

1. Cable shield must be grounded at one end only, at the Control Panel. Coil and tape cable shield at the Detector end.
2. Set SW3 (rotary switch) to position one (1) for Source current wiring.
3. Set SW3 (rotary switch) to position zero (0) for Sink current wiring.

Drawings *(continued)*

Wiring and Terminal Connections *(continued)*

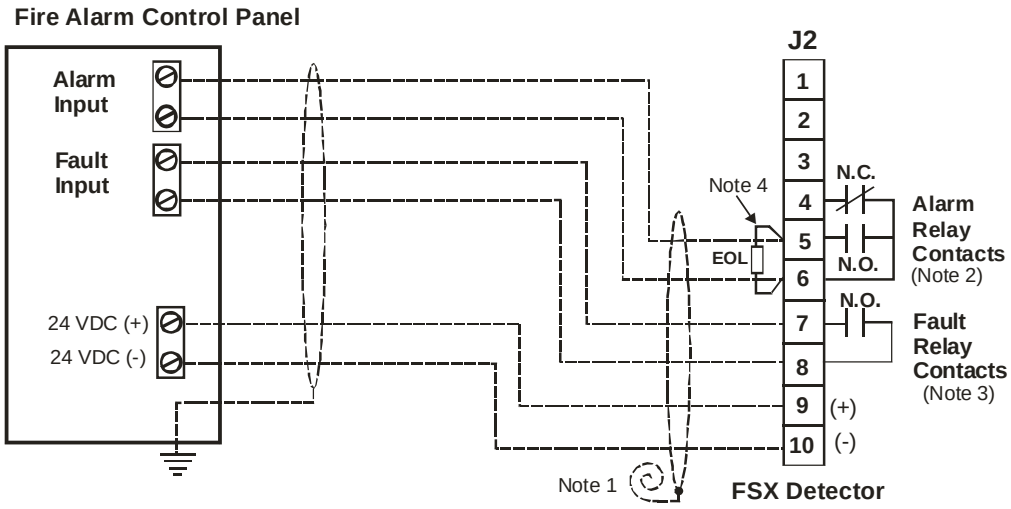


Figure 4-7
Typical Relay Output Wiring for Monitoring Separate Alarm and Fault Contacts

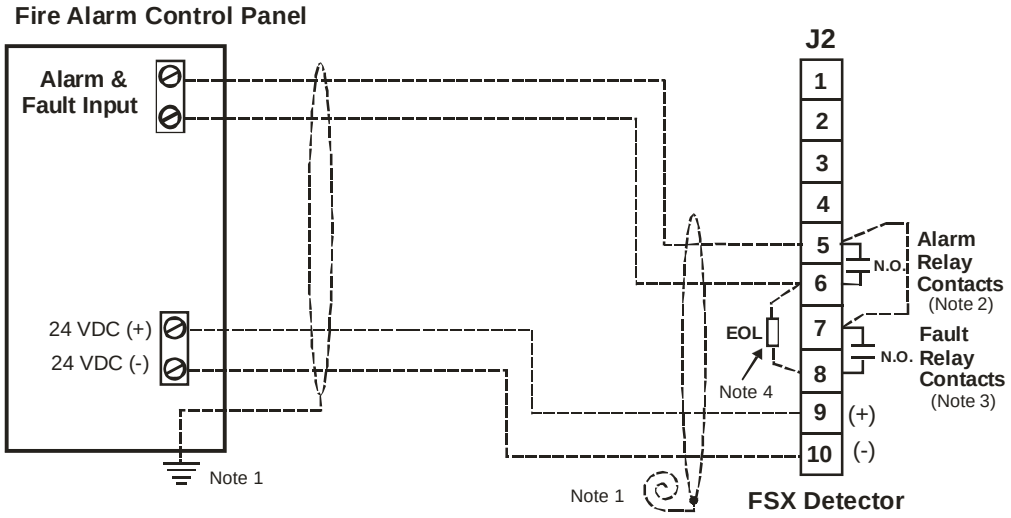


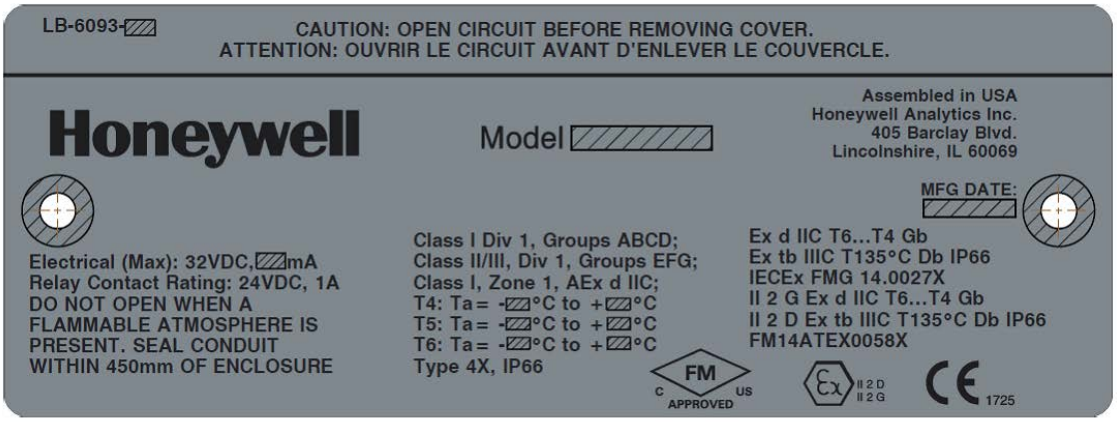
Figure 4-8
Typical Relay Output Wiring for Monitoring Alarm and Fault Contacts on a single two-wire input

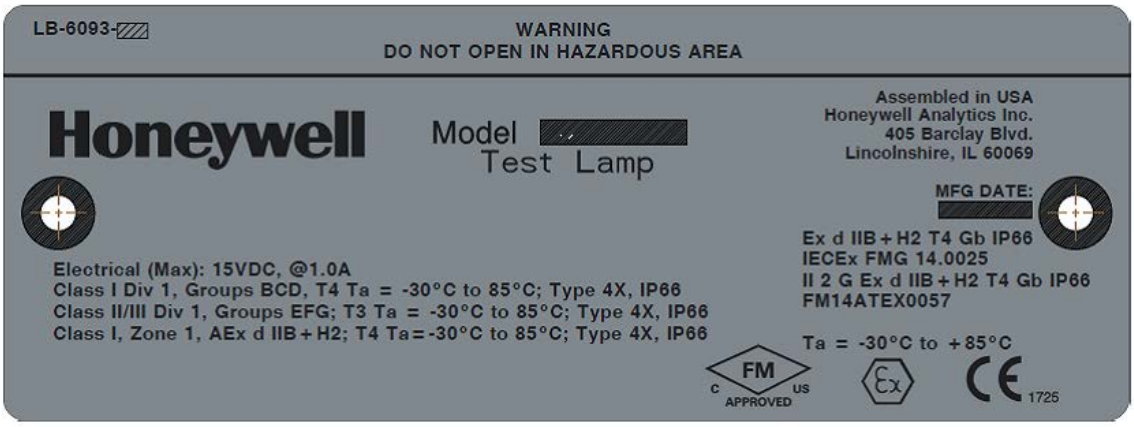
NOTES:

1. Cable shield must be grounded to “Earth Ground” at the Control Panel end only. Coil and tape the cable shield at the Detector end.
2. Alarm relay contacts shown with no power applied. Alarm relay is normally De-Energized during normal operation and with no Alarm. This relay will Energize during Alarm conditions.
3. Fault relay contacts shown with no power applied. During normal operation and with no Fault, this relay will De-Energize and the N.O. (normally open) contacts will close.
4. EOL (End-Of-Line) device shall be installed as required and supplied by the Fire Alarm Panel.

Drawings *(continued)*

4.7.3 Detector Label Drawings




LB-6093-
WARNING
DO NOT OPEN IN HAZARDOUS AREA
Honeywell
Model
Test Lamp
Assembled in USA
Honeywell Analytics Inc.
405 Barclay Blvd.
Lincolnshire, IL 60069
MFG DATE:
Electrical (Max): 15VDC, @1.0A
Class I Div 1, Groups BCD, T4 Ta = -30°C to 85°C; Type 4X, IP66
Class II/III Div 1, Groups EFG; T3 Ta = -30°C to 85°C; Type 4X, IP66
Class I, Zone 1, AEx d IIB + H2; T4 Ta = -30°C to 85°C; Type 4X, IP66
Ex d IIB + H2 T4 Gb IP66
IECEx FMG 14.0025
II 2 G Ex d IIB + H2 T4 Gb IP66
FM14ATEX0057
Ta = -30°C to +85°C
FM
C US
APPROVED
1725

Part Number	Model Number	Material	Background Color	Text Color	mA	T4	T5	T6
LB-6093-053	FS24X	0.020' Al 1100-Hl4	Black	White	150	-40C to +85C	-40C to +75C	-40C to +60C
LB-6093-054	FS24X	0.020' 316 Stainless Steel	Polished	Black	150	-40C to +85C	-40C to +75C	-40C to +60C
LB-6093-055	FS24X-9	0.020' Al 1100-Hl4	Black	White	150	-40C to +85C	-40C to +75C	-40C to +60C
LB-6093-056	FS24X-9	0.020' 316 Stainless Steel	Polished	Black	150	-40C to +85C	-40C to +75C	-40C to +60C

INDEX

A

Alarm Condition, 15
Alarm LED, 12
Alarm Relay, 12, 15
Applications, 6
Auxiliary Relay, 15

C

CAUTION, 8
cleaning, 8, 16
Communications, 6
conduit plug, 10
conduit seal, 10
Configuring the Detector, 14
connector, 4, 10

D

Demo Mode, 14
Detector Connections, 9
Detector Puck, 9
Digital Communication Options, 19
DIP switch, 4

E

Explosion-Proof, 19

F

Fault Conditions, 16
Fault Relay, 10, 16
Features and Benefits, 5, 6
Fire, ii
FireBus I, 14, 16
FireBus II, 14, 15

G

Green LED, 15

H

Hazardous Locations, 4

I

Installation Practices, 10, 12

L

LED Status Indicators, 15

M

Maintenance, 16
Microprocessor Watchdog, 16
ModBus, 6, 14, 15, 16
Module, 8
Mounting Instructions, 7, 8
Multi-Spectrum, 4, 13

N

Normal Operation, 15

O

Opening the Detector, 8

P

Principle of Operation, 13
Product Overview, 4
Product Variations, 18

R

radiant energy, 4, 13
Red LED, 15
Relay Coil, 16
Relay Options, 4, 6

S

Self Test, 6
Sensitivity, 4, 6
Start-Up and Commissioning, 11

T

Temperature, 6, 16
Test Lamp, 12, 16, 19
Trouble, 16

W

Warranty Information, 17
weather-proof, 10

Y

Yellow LED, 15, 16

CONTACT HONEYWELL ANALYTICS

Americas

Honeywell Analytics Inc.
405 Barclay Blvd.
Lincolnshire, Illinois
USA 60069
Email: *detectgas@honeywell.com*

Europe

Life Safety Distribution AG
Javastrasse 2
8604 Hegnau
Switzerland
Email: *gasdetection@honeywell.com*

Asia Pacific

Honeywell Analytics Asia Pacific Co., Ltd.
#701 Kolon Science Valley (1)
43 Digital-Ro 34-Gil, Guro-Gu
Seoul, 152-729
Korea
Email: *analytics.ap@honeywell.com*

Internet

These Honeywell websites may be of interest to Industry Solution customers.

Honeywell Organization	URL
Corporate	www.honeywell.com
Honeywell Analytics	www.honeywellanalytics.com

Telephone

Contact us by telephone at these numbers.

Organization		Phone Number
Americas	Honeywell Analytics Inc.	1-800-538-0363 1-800-321-6320
Europe	Life Safety Distribution AG	{32-2} 728-2711
Asia Pacific	Honeywell Analytics Asia Pacific Co., Ltd.	+82 2 6909 0321 VOIP: +8 5401 0321

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microwatt.com • mwsales@microwatt.com

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